Notice of Allowability	Application No.	Applicant(s)	
	10/625,048	BARABASH ET AL.	
	Examiner	Art Unit	
	Usmaan Saeed	2166	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *the amendment dated 6/13/2007*.

2. ☒ The allowed claim(s) is/are *8-15, 20-23, 38-42, 44, 46 and 48 (renumbered as 1-20)*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date *8/29/07* .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☒ Other *See Continuation Sheet*.

HOSAIN ALAM
SUPERVISORY PATENT EXAMINER

Continuation of Attachment(s) 9. Other: Copy of Applicant's email for Examiners proposed amendment.

DETAILED ACTION

This communication is in response to the amendment filed on 6/13/2007.

After thorough search and examination of the present application and in light of the prior art made of record, claims 8-15, 20-23, 38-42, 44, 46 and 48 (renumbered as 1-20) are allowed.

Claims 1-7, 16-19, 24-37, 43, 45, 47 and 49 have been cancelled.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview/email with Attorney, Daniel J Swirsky, Registration No. 45,148 on August 29, 2007.

A copy of the attorneys email regarding the proposed examiner's amendment is also attached.

Please amend the claims, which were filed on 6/13/2007 with new versions as follows:

1 – 7 (cancelled)

8. (currently amended) A method according to claim 20 and further comprising:

designating any of said objects as "new"; and

deferring the tracing of said "new" objects during any cycle of a plurality of cycles during which any of steps a) – ~~g)~~f) are performed.

9. (original) A method according to claim 8 wherein said designating as "new" step is performed if said object is part of an allocation cache from which objects are currently being allocated.

10. (previously presented) A method according to claim 8 and further comprising:

periodically unmarking any marked card containing only "new" objects; and

periodically removing said "new" objects' "new" designation.

11. (previously presented) A method according to claim 10 wherein said periodically unmarking and periodically removing steps are performed if said object is part of an allocation cache from which objects are not currently being allocated.

12. (currently amended) A method for collecting garbage in a computing environment, the method comprising:

a) tracing a root object to any of its reachable objects in a population of objects;

b) marking any of said objects referred to in step a);

~~d)~~c) tracing any of said marked objects to an unmarked referent object of said marked object;

~~e)~~d) marking said unmarked referent object;

~~f)~~e) tracing said referent object marked in step ~~e)~~d) to any of its reachable objects;

~~g)~~f) marking any of said objects referred to in step ~~f)~~e);

~~h)~~g) tracing any unmarked root object referent to any of its reachable objects;

~~i)~~h) marking any of said objects referred to in step ~~h)~~g);

~~j)~~i) performing any of steps c) – ~~g)~~f); and

~~k)~~j) designating any unmarked object in said population of objects as available for reallocation,

wherein either of steps a) and ~~f)~~e) are performed for a given object only if the card to which the object belongs is not marked, wherein any of steps a) – ~~g)~~f) are performed upon said population of objects concurrently with the operation of a mutator upon said population of objects within said computing environment, and wherein any of steps ~~h)~~g) – ~~k)~~j) are performed upon said population of objects while no mutator operates upon said population of objects within said computing environment.

13. (original) A method according to claim 12 and further comprising marking said card if said mutator modifies an object pointer of an object in said card.

14. (currently amended) A method according to claim 12 wherein any of steps a) – ~~g)~~f) are performed concurrently.

15. (currently amended) A method according to claim 12 wherein any of steps ~~h)~~g) – ~~j)~~i) are performed concurrently.

16 - 19 (cancelled)

20. (currently amended) A method for collecting garbage in a computing environment, the method comprising:

a) tracing a root object to any of its reachable objects in a population of objects;

b) marking any of said objects referred to in step a);

~~d)~~c) tracing any of said marked objects to an unmarked referent object of said marked object;

~~e)~~d) marking said unmarked referent object;

~~f)~~e) tracing said referent object marked in step ~~e)~~d) to any of its reachable objects;

~~g)~~f) marking any of said objects referred to in step ~~f)~~e);

~~h)~~g) tracing any unmarked root object referent to any of its reachable objects;

~~i)~~h) marking any of said objects referred to in step ~~h)~~g);

~~j)~~i) performing any of steps c) – ~~g)~~f);

~~k)~~j) designating any unmarked object in said population of objects as available for reallocation; and

~~l)~~k) at any time while performing concurrently any of steps a) – ~~g)~~f), periodically determining whether a marked card contains at least one of said marked objects, and unmarking any marked card about which it is determined that it does not contain at least one of said marked objects,

wherein any of steps a) – ~~g)~~f) are performed upon said population of objects concurrently with the operation of a mutator upon said population of objects within said computing environment, and wherein any of steps ~~h)~~g) – ~~k)~~j) are performed upon said population of objects while no mutator operates upon said population of objects within said computing environment.

21. (original) A method according to claim 20 and further comprising marking said card if said mutator modifies an object pointer of an object in said card.

22. (currently amended) A method according to claim 20 wherein any of steps a) – ~~g)~~f) are performed concurrently.

23. (currently amended) A method according to claim 20 wherein any of steps ~~h)~~g) – ~~j)~~i) are performed concurrently.

24 – 37 (cancelled)

38. (currently amended) A system according to claim 44 and further comprising:

means for designating any of said objects as "new"; and

means for deferring the tracing of said "new" objects during any cycle of a plurality of cycles during which any of means a) – ~~g)~~f) operate.

39. (original) A system according to claim 38 wherein said means for designating as "new" is operative if said object is part of an allocation cache from which objects are currently being allocated.

40. (original) A system according to claim 38 and further comprising:

means for periodically unmarking any marked card containing only "new" objects; and

means for removing said "new" objects' "new" designation.

41. (original) A system according to claim 40 wherein said means for periodically unmarking and said means for removing are operative if said object is part of an allocation cache from which objects are not currently being allocated.

42. (currently amended) A system for collecting garbage in a computing environment, the system comprising:

a) means for tracing a root object to any of its reachable objects in a population of objects;

b) means for marking any of said objects referred to in a);

~~d)~~c) means for tracing any of said marked objects to an unmarked referent object of said marked object;

~~e)~~d) means for marking said unmarked referent object;

~~f)~~e) means for tracing said marked referent object in ~~e)~~d) to any of its reachable objects;

~~g)~~f) means for marking any of said objects referred to in ~~f)~~e);

~~h)~~g) means for tracing any unmarked root object referent to any of its reachable objects;

~~i)~~h) means for marking any of said objects referred to in ~~h)~~g); and

~~j)~~i) means for designating any unmarked object in said population of objects as available for reallocation,

wherein either of tracing means a) and ~~f)~~e) trace a given object only if the card to which the object belongs is not marked, wherein any of means a) – ~~g)~~f) operate upon said population of objects concurrently with the operation of a mutator upon said population of objects within said computing environment, and wherein any of means ~~h)~~g) – ~~j)~~i) operate upon said population of objects while no mutator operates upon said population of objects within said computing environment.

43. (cancelled)

44. (currently amended) A system for collecting garbage in a computing environment, the system comprising:

a) means for tracing a root object to any of its reachable objects in a population of objects;

b) means for marking any of said objects referred to in a);

~~d)~~c) means for tracing any of said marked objects to an unmarked referent object of said marked object;

~~e)~~d) means for marking said unmarked referent object;

~~f)~~e) means for tracing said marked referent object in ~~e)~~d) to any of its reachable objects;

~~g)~~f) means for marking any of said objects referred to in ~~f)~~e);

~~h)~~g) means for tracing any unmarked root object referent to any of its reachable objects;

~~i)~~h) means for marking any of said objects referred to in ~~h)~~g);

~~j)~~i) means for designating any unmarked object in said population of objects as available for reallocation; and

~~k)~~j) means for periodically determining at any time concurrently with the operation of any of means a) – ~~g)~~f) whether a marked card contains at least one of said marked objects, and unmarking any marked card about which it is determined that it does not contain at least one of said marked objects,

wherein any of means a) – ~~g)~~f) operate upon said population of objects concurrently with the operation of a mutator upon said population of objects within said computing environment, and wherein any of means ~~h)~~g) – ~~j)~~i) operate upon said population of objects while no mutator operates upon said population of objects within said computing environment.

45. (cancelled)

46. (currently amended) A computer program embodied on a computer-readable medium, the computer program comprising:

a) a first code segment operative to trace a root object to any of its reachable objects in a population of objects;

b) a second code segment operative to mark any of said objects referred to in a);

~~d)~~c) a ~~fourth~~third code segment operative to trace any of said marked objects to an unmarked referent object of said marked object;

~~e)~~d) a ~~fifth~~fourth code segment operative to mark said unmarked referent object;

~~f)~~e) a ~~sixth~~fifth code segment operative to trace said marked referent object in ~~e)~~d) to any of its reachable objects;

~~g)~~f) a ~~seventh~~sixth code segment operative to mark any of said objects referred to in ~~f)~~e);

~~h)~~g) a ~~eighth~~seventh code segment operative to trace any unmarked root object referent to any of its reachable objects;

~~i)~~h) a ~~ninth~~eighth code segment operative to mark any of said objects referred to in ~~h)~~g); and

~~j)~~i) a ~~tenth~~ninth code segment operative to designate any unmarked object in said population of objects as available for reallocation,

wherein either of said code segments a) and ~~f)~~e) are operative to trace a given object only if the card to which the object belongs is not marked, wherein any of said code segments a) – ~~g)~~f) operate upon said population of objects concurrently with the operation of a mutator upon said population of objects within said computing environment, and wherein any of said code segments ~~h)~~g) – ~~j)~~i) operate upon said population of objects while no mutator operates upon said population of objects within said computing environment.

47. (cancelled)

48. (currently amended) A method for collecting garbage in a computing environment, the method comprising:

a) a first code segment operative to trace a root object to any of its reachable objects in a population of objects;

b) a second code segment operative to mark any of said objects referred to in a);

~~d)~~c) a ~~fourth~~third code segment operative to trace any of said marked objects to an unmarked referent object of said marked object;

~~e)~~d) a ~~fifth~~fourth code segment operative to mark said unmarked referent object;

~~f)~~e) a ~~sixth~~fifth code segment operative to trace said marked referent object in ~~e)~~d) to any of its reachable objects;

~~g)~~f) a ~~seventh~~sixth code segment operative to mark any of said objects referred to in ~~f)~~e);

~~h)~~g) a ~~eighth~~seventh code segment operative to trace any unmarked root object referent to any of its reachable objects;

~~i)~~h) a ~~ninth~~eighth code segment operative to mark any of said objects referred to in ~~h)~~g);

~~j)~~i) a ~~tenth~~ninth code segment operative to designate any unmarked object in said population of objects as available for reallocation; and

~~k)~~j) an ~~eleventh~~tenth code segment operative at any time concurrent to the operation of any of said code segments a) – ~~g)~~f), to periodically determine whether a marked card contains at least one of said marked objects, and unmark any marked card about which it is determined that it does not contain at least one of said marked objects,

wherein any of said code segments a) – ~~g)~~f) are operative upon said population of objects concurrently with the operation of a mutator upon said population of objects within said computing environment, and wherein any of said code segments ~~h)~~g) – ~~j)~~i) are operative upon said population of objects while no mutator operates upon said population of objects within said computing environment.

49. (cancelled)

Reason for Allowance

The prior art made of record does not teach or fairly suggest the combination of elements, as recited in independent claims 12, 20, 42, 44, 46, and 48.

More specifically, the prior art of records does not specifically suggest a combination of elements including "wherein either of steps a) and e) are performed for a given object only if the card to which the object belongs is not marked" in independent claims 12, 42 and 46 and "at any time while performing concurrently any of steps a)-f),

periodically determining whether a marked card contains at least one of said marked objects" in independent claims 20, 43 and 48.

These features together with other limitations of the independent claims are novel and non-obvious over the prior art of record. The dependent claims 8-11, 13-15, 21-23, and 38-41 being definite, enabled by the specification, and further limiting to the independent claims, are also allowable.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Usmaan Saeed whose telephone number is (571)272-4046. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hosain Alam can be reached on (571)272-3978. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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